THE MOTOR AGE

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LEADING CONTENTS

THE ROAD IMPROVEMENT FALLACY

CRY FOR IMPROVED ROADS AS A NECESSARY CONDITION FOR THE PROGRESS OF THE MOTOR VEHICLE INDUSTRY ILL FOUNDED AND LIKELY TO LEAD CONSTRUCTION AND DESIGN INTO UNPROFITABLE CHANNELS.

There are people who are talking and writing about road improvement as the condition for motor vehicle development.

They seem to think that in advancing this fallacy they are saying a good word for motor vehicles.

But the motor vehicle industry would starve if it should wait for road improvement. To state that motor vehicles require fine roads first of all is tantamount to damning the motor vehicle in the United States. The motor vehicle can now go over bad roads just as well as horses, unless it is heavier than the horse-drawn wagon. When it breaks down it is partly because constructors foolishly attempt to put 2,000 lbs. of weight over axles and springs not fit for the load, and then go at increased speed, too. That is one reason, but the chief cause for break downs lies in imperfect construction of motors. It is usually something in the motor that breaks.

Were the motor perfect, sufficiently powerful and the weight supported on the four wheels, no greater than in horse carriages, the motor vehicles would pass over bad roads better than horse-carriages.

Speed a Subordinate Advantage.

The idea of waiting for road improvement originates from the false impression, derived from France, that speed is the main advantage of motor vehicles.

Speed is a subordinate consideration in reality. It comes to the front so long as the motor vehicle is deficient in other virtues and excels in speed. It recedes into the background as soon as the "good" motor vehicle is produced.

But there is something fundamentally wrong in expecting good results from loading the weight of a horse or two into a wagon, in the form of a motor, and then support that wagon on four wheels that look like they were made for a light carriage and then treat the whole thing as a light carriage in regard to speed on rough roads.

When a carriage of similar type is drawn by horses the weight of the latter is supported at 8 points of contact with the road (or, at a trot, at 4) and the wagon at four other points.

So long as the surface of contact between road and motor vehicle is three or four times smaller per pound of weight supported than in horse carriages, there will be trouble on bad roads, and it is true that much of this trouble could be avoided by making the roads hard and smooth. But the first step is not to improve 100,000 miles of road, more or less —which is not likely to be done by this generation—but to improve what can be improved viz.: the construction of the motor vehicle.

More Points of Support.

What has been done in this respect is to put it on pneumatic tires, but thereby has merely been created a new problem more vexatious than the one to be solved in the first place.

The chances for producing pneumatic tires that will stand heavy loads and heavy side-thrusts are not at all encouraging.

The motor vehicle, being heavy, should have more points of support. Perhaps it should have 6 wheels. Perhaps it should be drawn by a tractor, the tractor itself on 2, 3 or 4 wheels—or one broad wheel. Those things are for experimenters to determine. But the vehicle should not be expected to travel fast over rough roads or muddy roads until it has been made fit for such work.

Respect Existing Conditions.

The tire problem will await—unsolved —a vehicle construction that puts less weight on each tire; and the tire industry is most vitally interested in pushing that vehicle construction which will make elastic tires thoroughly practicable.

Road improvement will await—undone —a construction of motor vehicles that makes motor vehicles thoroughly practicable on bad roads, for, if motor vehicles are not demonstrated practicable on bad roads, they will not be demonstrated practicable at all, considering that the roads we have ARE bad.

To expect that the motor vehicle should furnish an incentive to road building so long as it is on the scales for approval or disapproval, itself, seems unreasonable.

No roads would ever have been built for horses if horses had not proved that at a pinch they could give good service without roads.

Don't preach that motor vehicles depend on roads. They don't. They depend on good, suitable construction to negotiate any kind of road surface, and on perfectly reliable motors.

Preach, if you like, that speed depends on good roads. Because it does. It does so for horses, too. And for locomotives. And for boats; a rough sea is a rough road.

But it is worth noting that a motor vehicle well built to go at fair speed on a bad road, will also by the same construction be fitted to go much faster over a somewhat better road.

American motor vehicles should be built for bad roads, and if the American people will then turn around and build good roads for good motor vehicles, so much the better.

No race track was ever built or trainers hired for foundered and spavined horses.

WOOD OR WIRE WHEELS

Probably no builder of motor vehicles has satisfied himself completely in regard to whether it is advisable to fit wood or wire wheels to motor vehicles. It is generally supposed that the public will prefer wood wheels as being more readily kept clean and neat and in better accordance with conventional ideas of how a carriage should look. The wood wheel is also usually considered stiffer laterally than the suspension wheel, and, therefore, better adapted to resist the side thrusts, to which the wheels of any three or four-wheeled vehicle are subject.

All other arguments in favor of wood wheel may be considered of minor weight, but these two are, on the other hand, deemed so important that most manufacturers in the United States today specify wood wheels for heavy carriages and wire wheels for lighter ones.

Such an anomaly as it would apparently be to fit wood wheels in front—if the steering is in front—and suspension wheels in the rear, for driving, is as yet unheard of. It would look peculiar, but from a mechanical standpoint would probably be correct.

European experience has not so far favored wood wheels, but then Europe has no hickory to make them from. Also, European carriages have been mostly intended for high speeds and the usual construction of hubs for wood wheels is hardly fit to resist the great strains that arise when a heavy carriage must be rapidly started, suddenly stopped and driven up-hill at high speed by a force transmitted through the wheel axle. It is European experience that this strain tends to twist the spokes out of the hub and rapidly deteriorates the wheel. European preference has, therefore, settled in favor of tangentially laced wire suspension wheels as the only ones adapted for driving a heavy carriage at high speed.

Whether the same result will be reached in regard to electric carriages seems yet doubtful. In these a great reduction of the motor speed is required, and it has been customary to attach a large phosphor-bronze spur wheel to the spokes near the rim of the wheel, and driving this by a small rapidly revolving pinion. This mitigates the strain on the inner ends of the spokes, but on the other hand exposes the large spur gear to warping—with sad results—and it is noticed that one of our most prominent makers of electric vehicles has lately mounted the large spur wheels on the axle while formerly he attached them to the spokes.

ASCENSION OF MOUNT HAMILTON

DESCRIPTION BY DR. DAVID STARR JORDAN OF TWENTY-EIGHT MILES OF UPHILL TRAVELING BY MEANS OF AN ELLIOTT GASOLENE MOTOR VEHICLE.—SHARP DISTINCTION MADE BETWEEN EXPERT AND AMATEUR DRIVING.—PROF. SMITH'S QUALIFIED CONVERSION.

It is at present a rare occurrence to have a motor vehicle journey described by perfectly disinterested persons of undoubted competency and veracity. Such a description is a real event for all interested in learning the facts about motor vehicles.

Through the enterprise of The Examiner of San Francisco President David Starr Jordan of the Stanford University, was last month induced to undertake a trip to the Lick observatory on the summit of Mount Hamilton, from which two descriptions of the desirable character referred to have resulted. Being in the nature of a mountain-climbing expedition, the enterprise gains additional significance.

Dr. Jordan wisely suggested that Prof. Albert W. Smith, the head of the mechanical engineering department of the Stanford University, should accompany the expedition. And so it came to be. Two members of The Examiner's staff followed in a horse-drawn carriage, all parties taking turns at auto-tobogganing down the mountain road on the return trip.

W. L. Elliott of Oakland, the builder of the motor vehicle, had charge of the driving. In the accompanying illustration he and Dr. Jordan are shown occupying the vehicle, and Prof. James E. Keeler of the Lick observatory greeting the party upon their arrival at the top of the mountain.

Grades of the Road.

The party left Hotel Vendome at San Jose at noon September 13 and made the summit in a running time of 5 hours 20 minutes, covering a distance of 28 miles with an ascent of 4,100 feet. Most of the rise comes on the last half of the trip, from Smith creek (altitude 2,146 feet) up. On this stretch the road's heaviest grade is, according to Engineer A. T. Herrmann, who built the road, about 6 per cent, while the lower part of the road varies from 1 to 5 per cent.

Dr. Jordan's account of the experience, as will be noted, is a careful recital of the actual happenings and worthy of close study in regard to its reservations, no less than its statements. He writes:

The summit of Mount Hamilton is 4,120 feet above the city of San Jose, with which it is connected by an admirably graded road twenty-eight miles long, half the rise being in the last seven miles.

The Mechanical Incidents.

The trip was made successfully in about five and one-half hours, and three and one-half for the return, exclusive of stops.

There were no accidents and few incidents. Two or three times some part of the engine got out of order. Twice a spring overheated, lost its temper and became bent and had to be straightened. Twice the copper wire which carries electric sparks to the engine, had to be adjusted. In coming down the steep grade, toward the top of the mountain, one of the three or four brakes was worn out by the friction and once by a moment's inadvertence the steering gear was thrown out of order. None of these involved any serious difficulty or loss of time, though any of them might puzzle an amateur driver who was not a mechanician.

The "Elliott Automobile," invented and built by W. F. Elliott of Oakland, consists of a carriage box mounted on low wheels and propelled by a gasolene engine in a box behind the seat.

This particular carriage has a single, broad, well-upholstered seat for two persons, protected by an ordinary "buggy top." The wheels are built like those of a bicycle with steel spokes, and they are protected by extremely thick, broad, inflated rubber tires. The power from the engine is applied to the hind wheels. The steering apparatus, which rises in front of the seat, is attached to the fore wheels

by an ingenious device, and the movement of the carriage is under the most perfect control. The details of the machine I shall not try to describe. It is sufficient to say that the perfect control of the movements of the vehicle is one of its strongest features. So long as the driver keeps his head and makes no slips, the carriage obeys him absolutely, making the sharpest turns without risk or difficulty. For the same reason it may take as long for an amateur to learn to drive an automobile accurately as to learn to drive a team. In amateur hands the descent of Mount Hamilton would be certainly dangerous.

With absolute confidence in the driver, the comfort of the ride in his vehicle is the perfection of comfort.

Sails Across Car Tracks.

The low, rubber-tired wheels take away the impact of stones and inequalities. The carriage sails across car tracks at any angle and its occupants are unconscious of them. Five miles on an automobile are less fatiguing than one in an ordinary surrey. (When somebody else is driving.—Ed.). The jar of the machinery is but slight, except for a moment before starting, and except when tugging up steep grades it is practically noiseless. The smell of gasolene is not noticeable most of the time. The virtual absence of dust is also very important. In ordinary driving the horses stir up the dust while the small wheels of the automobile raise very little of it.

ELLIOTT VEHICLE AT LICK OBSERVATORY.

Furthermore, nothing shuts off the view forward. As the vehicle bowls along the road is in plain view and its occupants have the sensation produced by riding on the cow-catcher of an engine, and this without the monotony of a level track.

Horses look with disfavor on the automobile, but of the many we met, but one did anything more than start up a little. In the city of San Jose the horses accustomed to electric cars for the most part paid no attention at all. On a wide road

their momentary fright offers no embarrassment, little more difficulty. In one case only did we have any embarrassment. A common horse, driven by two Portuguese laborers, persisted in turning around and backed its wagon in front of the automobile, which stopped to avoid the collision. When the beast stepped forward the machine moved on and that was all of it. With reasonable care there is no danger to teams. It is surprising, however, to note how many teamsters going to or from the city are half asleep, driving carelessly with slack rein. It is also noticeable that the average driver is watching the machine rather than his own horses.

We left San Jose at noon on Wednesday. Through the crowded streets Mr. Elliott moved slowly and carefully, but along Santa Clara street, when not obstructed by teams, we were able to fly along at the rate of twelve to eighteen miles an hour. On the heavy grades of Mount Hamilton we made about four miles an hour, and toward the top but three. The engine is sensitive to grade and to dust, and on the very heavy grades she kicks stoutly with her "hind legs."

Coasting Down Hill.

Returning, we left the observatory at 10 a. m. on Thursday, reaching San Jose at 2:15, with about forty-five minutes of stops on the road. The descent was made for the most part by gravity alone, and nothing can be more delightful than a swift coast down the windy side of a mountain. The speed could have been much greater with relative safety, but with some risk from dashing into teams around the corners, or from possible accidents to the machinery.

Up hill or down the good team which accompanied us kept up with the machine, but on level ground it was soon left far behind.

As to the future of the giant automobile as a substitute for the street car and omnibus, I have no basis for an opinion. Nor can I compare the Elliott vehicle with any of the various styles with which it must compete. As it is, it is an eminently satisfactory carriage to the rider who has no responsibility for steering it or handling its machinery. The tendency of improvement will be toward simplifying the latter and making it self-corrective. The cost of fuel is slight (about 90 cents for fifty-six miles of use, about five gallons of gasolene having been used). The cost of the vehicle (about $1,200) makes it, however, a matter of luxury. With rich men and women having a taste for mechanism or for adventure it must become deservedly popular.

An automobile could be run over delightful roads in quick time; for example, from Francisco to San Diego, and at a mere trifle of cost for fuel. The sole difficulty would be the need of mechanical skill for repairs and adjustments.

With a Professional Driver.

I look forward to the time when the automobile for two shall be provided with a rear seat, as in the hansom cab, for a mechanical engineer in livery. The seat should have an additional set of steering apparatus, by which the vehicle may be stopped, turned or reversed regardless of what is done by the amateur hands which control the usual steering apparatus. By this addition the machine may be made perfectly safe and may be guaranteed for any distance and up or down grades as long and steep as those of Mount Hamilton. At the same time it will form the most delightful of all modes of travel, especially in a country charming in scenery and equable in climate as is the case with California.

Prof. Smith's New Experience.

Prof. Smith describes the event humorously as follows:

We found Mr. Elliott at the Hotel Vendome, in San Jose, with his automobile. It certainly is an attractive looking vehicle. It is actuated by a horizontal, two-cylinder gasolene engine, with the crankshaft in front of the cylinders. The crankshaft has three connections with an intermediate shaft, with friction clutches for throwing in and out of gear. One connection gives a speed of five miles an hour for hill climbing, another a speed of eighteen miles an hour for smooth, level roads, and the third connection is for reversing. This intermediate shaft is connected to the rear axle. The engine is well designed and well built, and all the machinery is compactly arranged.

Experience had led me to believe that a gasolene engine is totally depraved; that it will run along perfectly for a long time, doing everything that could be expected of the most conscientious engine; then having gained the confidence of the trusting man, it will balk suddenly, and monkey-wrenches and oil, brains and profanity, are alike powerless to make it run. I once knew a man who was to give a lecture before a large New York audience. The lecture was to be illustrated by all sorts of beautiful and interesting things that depended on an electric current. The lecturer put his trust in a gasolene engine. It balked, and the audience went home disgusted. But then—Mr. Elliott was not there. I am now satisfied that no gasolene engine could resist Mr. Elliott. Every time he put on his starting crank I was ready to say: "That's just what I expected." But somehow my remark did not come off. The engine always started. I believe that he said some magic words each time, like the boy with the mill which afterward made the sea salt.

The automobile started from the Hotel Vendome, and ran out over the level, and up hill and down and up again, until it stood before the great dome of the Lick observatory.

I rode down the slope into Smith's creek and the tingles ran up and down my back, and out to my fingers' ends. I have had no such experience since the awful pleasures of witch tales years ago.

On the way down the mountain the brake gave out; but there was an emergency brake, and all went well. And so we slid down into San Jose, and the trip was over.

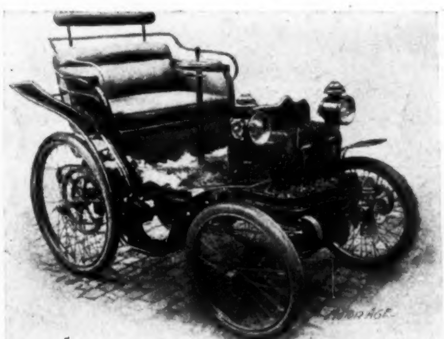
The horse must surely go, for the era of automobiles is upon us. What a pity it is that Mr. Elliott cannot run all of them.

FINE BELGIAN VOITURETTE

Brussels, Sept. 30.—The most of the European motor car manufacturers are still in a state of transition. They are producing more models than numbers of vehicles; in short, they are not yet sure which pattern will give satisfaction. This style of production has many disadvantages which must be obvious to everyone. It is not only that the companies cannot declare any dividends, or that the prices must remain very high; it demoralizes also the designers and the workmen, who, through the continued pressure of working always on new patterns, neglect perfecting the details of the pattern which they are marketing.

An exception in this respect forms the Fabrique Nationale d'Armes de Guerre (National Arms factory), in Herstal, Liege, Belgium.

To see the motor carriage, model A, made by this company, drive it under severe conditions, and inspect its parts and accessories, proves to the mind of your correspondent that this carriage is as nearly perfect as any produced in any part of Europe. The fuel of the motor is gasolene and it has 3 h. p. for a single seated car, like the one shown in the illustration. The weight of the whole car is 500 pounds. Every part of the motor



Gasolene Voiturette. Made at National Arms Works, Herstal, Belgium.

and the car can easily be taken off and exchanged for another. The transmission of power is by belt and friction cones.

A seat for a driver or footman can easily be attached if desired.

EARLY STEAM ROAD VEHICLES

UNSUCCESSFUL ATTEMPTS FORGOTTEN BY NEXT GENERATION.—WEIGHT AND BULK PROVE THE STUMBLING BLOCKS.—ROUSED ENTHUSIASM IN THEIR DAY.

The curious, and perhaps significant point about the history of early attempts at utilizing steam for the transportation of vehicles over common roads is that the noteworthy ones were renewed with an interval of about a generation between each. Thus, after the first schemes in 1759-69, we find Trevithick working in 1802-4; Gordon, Church and many others in 1832-6, and Boydell, Aveling and others from 1855 to the time of the American civil war, while in the early seventies Thompson, of Edinburgh, took up the work with more enthusiasm than success.

Trevithick, perhaps the greatest genius among early traction engine inventors, seems at first to have believed that (to quote his own words) "railroads are useful for speed and for the sake of safety, but nothing otherwise; and every practical purpose would be answered by steam on the common roads, which can be applied to every purpose a horse can effect." In this belief there was, of course, a fallacy. The only reason that greater speed is obtainable on a pair of rails, with a locomotive and its train, than if the same equipment were put on a road without rails is that the rail offers a hard, smooth, unyielding surface, while the ordinary road presents a soft, rough and yielding surface. In fact, only a year or so after his patent for 1802, Trevithick came to the conclusion that steam carriages could not be placed upon the common roads before the latter were radically improved and rendered able to bear heavy loads without giving way and increasing the draft to an impracticable amount.

The art of constructing light weight steam engines and neutralizing the effect of bad roads by the economy in weight was not yet learned, and it did not become common property of the machine building world until after tube drawing and other forms of work by automatic machinery had been perfected.

In the journal of the Franklin Institute for November, 1827, there is recorded a description of a steam engine for common carriages patented by W. H. James. In this engine two pairs of cylinders were employed, each pair driving one of the front wheels. For heavy carriages he prefers to drive the rear wheels also using two more pairs of cylinders for this purpose. In the Journal above referred to the steering mechanism is described as follows:

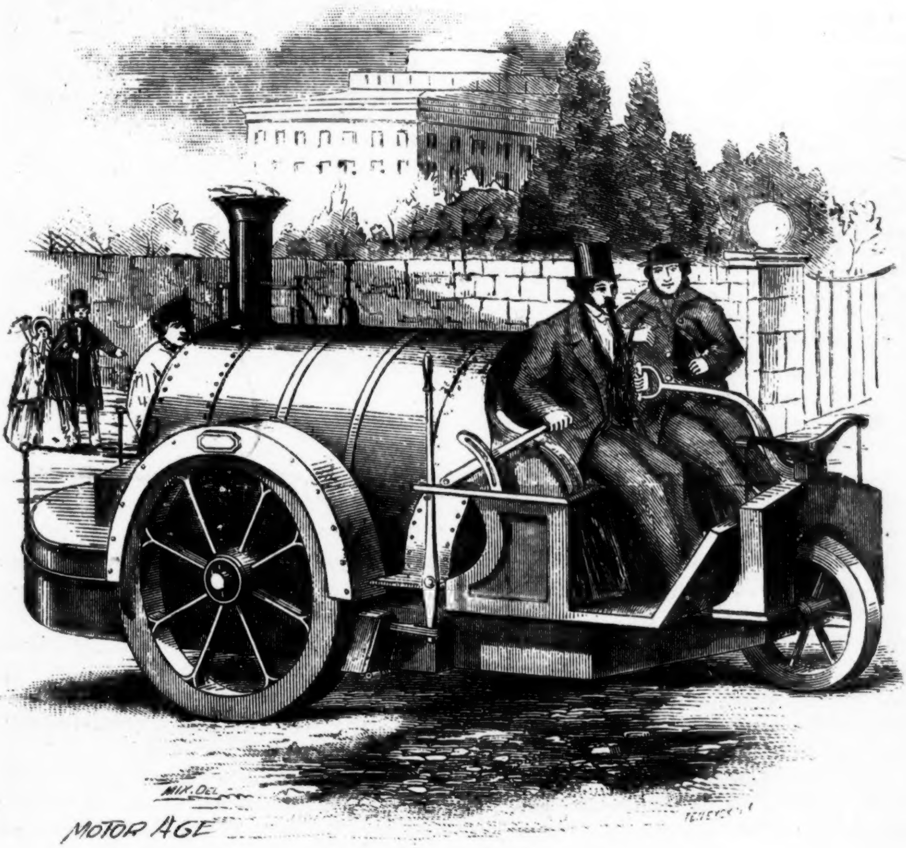
Instead of actuating the several wheels of a carriage with a single engine, as heretofore, Mr. James adapts separate engines to each wheel. These engines are of small and equal dimensions, and have their steam supplied by pipes connected with the boiler, situated in a convenient part of the carriage. The object of the patentee, in employing separate engines, is, that each wheel may have a motion independent of any of the other wheels, so that their powers or velocities may be varied at pleasure, which is essential in passing round curves, or turning corners of the road; because (as is well understood) when a carriage moves in the arc of a circle, the outer wheel passes over a greater distance of ground than the inner wheel—consequently rendering it necessary that the engine connected with the outer wheel should be made to work so much faster than the engine connected with the inner wheel: this Mr. James effects most completely by a very charming and exceedingly simple contrivance,—he causes the fore axletree to be connected with a stop-cock placed in the main pipe, through which the steam passes from the boiler to the respective engines; this stop-cock is so constructed, that when the fore axletree stands at right angles to the perch, (i. e. when the carriage is proceeding in a straight line) it admits equal quantities of steam to each engine; but whenever the axletree stands obliquely to the perch (as in making curves in the road), it causes the stop-cock to admit a greater quantity of steam to the engine connected with the outer wheel, so as to cause that wheel to revolve faster, and a diminished quantity to the engine connected with the inner wheel, so as to make it revolve slower, in exact proportion to the curve around which the carriage is moving.

The inventor would probably come to grief with this engine-steering mechanism which might easily get the best of

the driver's hand power at the steering lever, but the fundamental objection to the James vehicle was still the same which had frustrated previous efforts: the excessive weight of the vehicle for the power required on ordinary roads.

One Generation Back.

In the London Illustrated News, May, 1860, a much later attempt is recorded, which shared the fate of predecessors on a handle (without stopping), the power is multiplied two and a half times, and the speed consequently reduced to four miles per hour on hills with inclination of 1 in 10. The carriage is mounted on three wheels, each having independent springs—one small wheel in front, which is used for steering, and two behind, one or both of which are employed in propelling; one of them being fixed on the shaft and the other engaged by a clutch, so that when disengaged the carriage may be turned around in its own length without stopping. It is easily guided,



RICKETT'S STEAM CARRIAGE—A. D. 1860.

account of weight, bulkiness, smoke, etc. The description becomes interesting when compared with the many examples of latter day enthusiasm for untried vehicles.

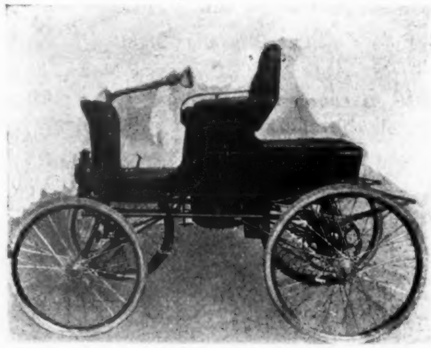
It is arranged to run at an average speed of ten miles per hour; indeed, on good roads, 16 miles per hour has been easily attained. In ascending steep hills, by moving by a handle from the fork of the front wheel, which is central with the outside seat; a brake is applied to each driving wheel, worked by a lever from the seat, so that the engine is entirely under the control of the driver.

The engine is built upon a tank, which forms a strong tubular framework; the boiler being placed above, and the whole of the machinery is contained in the space be-

tween the boiler and tank, entirely protected from dust and dirt, and within reach of the stoker for oiling, etc. The tank contains 90 gallons of water, sufficient for 10 miles' run. The boiler is made of steel, and constructed so that it is not injuriously affected by variations of level, as it is worked at a pressure of 150 pounds to the square inch, and supplies steam to a pair of 3½-inch cylinders with 7-inch stroke; it evaporates about 1½ gallons of water per minute, and consumes from 8 to 10 pounds of coal per mile. The weight of the engine and carriage is 30 cwt., and, with a full load of water 12 cwt., coal 3 cwt., passengers 5 cwt., equals 2½ tons.

Some idea may be formed of the functional resistance on common roads, when it is mentioned that as much power is required to draw 1 ton on a common road as 15 to 20 tons on a railroad; and in this engine, to convey its full load at 15 miles per hour on a level, requires an actual development of 10-horse power, so that great power and little weight are essentials in these engines. No great difficulty has been experienced in working them—occasionally, a young horse shies, when the engine is instantly stopped, and all noise and appearance of steam suppressed till it has passed. It is stated that this engine will be shortly taken to Belgium, but others are in course of manufacture by Mr. Rickett, in his foundry at Buckingham, England.

We do not know but that the time may yet arrive when there will be a great "Derby day" for steam horses, and when gentlemen will mount true fire-blooded animals, contending, with lungs of iron, for prizes of



American Steam Wagon—A. D. 1899.

gold. Mr. Rickett has, at least, led the way with the foregoing engine for such enterprises.

For comparison an illustration of one of our latest American steam vehicles is given.

WEIGHTS OF POWER SOURCES

Just now we are beginning to fully recognize the value of the internal combustion motor, which stands today almost exactly where the steam engine stood a hundred years ago, although, having the steam engine as a familiar and universally accepted prime mover, the gas engine is not the startling and world-revolutionizing novelty that the steam engine was in the year 1800, writes Hugh Dolnar in American Machinist.

In the steam engine the fire burns continuously, while in the internal combustion motor a new fire is lighted, burns and is extinguished, for each working stroke of the motor. Hence, as it is highly desirable for most purposes that the action of any prime mover should be rapid, so that the motor shaft may turn at a high speed, internal combustion engine makers naturally turned to the most easily lighted and rapidly burning fuels they could find, and used various combustible gases mixed with a proper proportion of air for the cylinder charge.

Up to the present time it has been supposed that where the entire fuel charge of an internal combustion engine was to be simultaneously fired, the fuel must be in the form of gas, so that it could be mixed with air as rapidly as is needful; and gasolene, which very easily assumes the form of gas, natural gas and producer gas are among the fuels most often used in internal combustion engines.

Kerosene oil is cheaper fuel than any of the above, and many attempts, more or less successful, have been made to burn kerosene in internal combustion motors, because it is not only cheap, but is everywhere obtainable and is both convenient and safe to handle.

The following table shows the work,

expressed in foot-pounds, which may be obtained from various sources of power now in use or under consideration:

Source of power.	Foot-pounds per pound of medium.
Good storage battery	15,000
Liquid air, from 2,000 lbs. to atmosphere	139,100
Coal, 14,600 B. T. U., used in steam plant of 12½ per cent. efficiency	1,408,000
Kerosene oil, 20,700 B. T. U., internal combustion motor plant of 35 per cent. efficiency	5,593,000

That is to say, it requires 50 pounds of liquid air or 400 pounds of storage battery to deliver the power obtainable from one pound of kerosene oil, costing about 1 cent. As a reservoir of power, one gallon of kerosene oil has more capacity than one ton of storage battery. The average export value of refined kerosene oil was, in 1888, 7.9 cents per gallon, and 1898 5.2 cents, having fallen from 24.9 cents in 1872 to 5.2 cents in 1898. New sources of kerosene supply are constantly being discovered and worked, and it is not at all probable that the price of kerosene oil will increase in the near future.

THOSE HEAVY ELECTRIC CABS

An automobile belonging to the Illinois Electric Vehicle Transportation Company fell into the cellar opening in front of the company's stables, 173 Michigan avenue, Chicago, last week, and there it stuck for several hours, for it weighed three tons, and was wedged in in such a way that it took a good-sized derrick to pull it out.

Another vehicle belonging to the same company ran over C. M. Corcoran, aged 57, who was taken to the hospital unconscious. The injury was not serious, however. A third vehicle belonging to the same company was noticed returning to the stable with a "hot box" emitting a trail of smoke. It had a fourth vehicle in tow, which had become disabled, and the work of pulling this had proved too much for one of the wheel bearings of number three. The two coupled cabs were stalled on the incline leading to the stable.

THE SCHOOLS OF INVENTORS

The little private schools of technology conducted on the experimental method which thousands of inventors have established, each by himself, all over the United States, under the impulse of the motor vehicle idea, are very expensive institutions of learning when compared with the Boston, the Stevens, the Cornell and other recognized schools, but, after all is said, the graduates from these little enthusiastic shops form the army that won the first battles for American industry by venturing fearlessly where the orthodox engineers feared to tread.

But the wastefulness in the process is appalling.

AIR MOTOR IN SAN DIEGO

W. W. Andrews, of San Diego, Cal., has produced an air motor and applied it to a vehicle. It operates with an initial pressure of 1,200 pounds to the square inch. The piston area is about 1 square inch. When the vehicle was tried the expansion of air produced such intense cold that "the engine was at once covered with ice and the pipes were frozen solid," according to a local report. What it was that "froze solid" in the pipes is not stated. The inventor will now apply a coil heater to overcome the cold, and by the time when he shall have learned the common phenomena of latent heat (and cold) will probably have a motor as complicated and unsatisfactory as that which was recently discarded on the street railway cars on Twenty-ninth and Thirty-first streets in New York city.

CLUBS, SPORT AND PLEASURE

RACE AT GALESBURG FAIR

SPEED CONTEST BETWEEN OLD AND NEW GASOLENE MOTOR VEHICLES RESULTS IN DISAPPOINTMENT ON ACCOUNT OF BREAKAGE OF SPARKING DEVICE IN THE OLDER CARRIAGE.

A fifty-mile race between Dr. E. V. D. Morris, of Galesburg, owner of a Winton automobile, and F. D. Snow, of Wyoming, Ill., the owner of a three-year-old Duryea carriage, was to have been one of the attractions at the county fair held at Galesburg, Ill., October 4. The contestants put up a prize of $2,000 for the winner.

Trouble Was Anticipated.

Before the appointed day Mr. Duryea, of Peoria, Ill., found occasion to publish a note of warning, however, as follows:

> In the interests of the business and in justice to our later goods, permit us to say that the vehicle owned by Mr. Snow was built in '96 by the Duryea Motor Wagon Company, of Springfield, Mass. It has now completed four seasons of running and is still able to give a fairly satisfactory showing.
>
> It was driven from Peoria to Wyoming last Friday, a distance of thirty-two miles, in two hours, without trouble. It is, however, a much heavier machine, has less power and is in many respects not to be compared with our later goods, which have been designed to embody the results of the experience gained since that vehicle was built.
>
> We trust that in view of the prominence the Galesburg race has been given and the interest manifested therein you will make this fact public. We would like to further say that we have no interest in the race or in Mr. Snow and are not responsible for pitting a machine of '96 pattern against a later make.

The event proved the wisdom of Mr. Duryea's precaution, for the race was terminated after a run of fifteen miles by an accident to the Snow carriage.

Race Forfeited by Accident.

The first mile was gone in three minutes and then the speed was increased. The automobiles showed little variation in speed until the eleventh mile.

In the ninth mile the doctor's automobile passed Snow and came around in 2:23. This was the best time of the entire race.

The fifteenth and last mile was gone in 3:08. At that time Snow came to the judges' stand and announced that his automobile was permanently disabled. He said the sparker had broken off in the cylinder and that the carriage could run no longer.

Under the terms of the race the disabling of either machine was a forfeiture. The judges in consequence announced Dr. Morris as the winner.

The fifteen miles were gone in forty-two minutes and eighteen seconds.

It was not the least remarkable feature of the race that Mr. Snow had himself insisted upon the forfeiture clause in case of accident, thus proving his faith in the losing carriage after an ownership extending over a sufficiently long period to enable him to judge of the merits of the vehicle.

Previous Injury on the Road.

An explanation of the accident may be found in an occurrence that took place two days in advance of the race. On that occasion Mr. Snow started from his home to Galesburg in company with C. L. Turner, of Peoria. As they were spinning along near West Jersey the axles of the wheels gave way and the front part of the vehicle dropped to the ground. Mr. Snow was pitched fifteen feet into a bridge and Mr. Turner was thrown up into the air. Both received severe bruises. The front axle of the automobile was broken and the rods twisted. The men came the rest of the way in a lumber wagon, trailing the automobile behind. The machine was put into the hands of machinists at once for repairs, but it seems probable that the injury to the

sparking device which subsequently was developed at the race originated from this tumble.

In the near future the latest Duryea construction will be submitted to a test that will go far to prove, or disprove, its suitability for practical purposes. It will be made with the much-heralded gun-carriage that the Peoria Rubber & Mfg. Company has constructed, under Mr. Duryea's supervision, for Major Davidson, of the Highland Park Military Academy. This vehicle is now reported to be ready for the proposed trip from Peoria, via Chicago, to Washington, D. C., and Mr. Duryea pronounces this vehicle in fitting order to be accepted as a sample of up-to-date work.

"It is a fine piece of work," he says. "The carriage behaves nicely. It is not an unruly member by any means, and we do not anticipate any trouble in its control. It is one of the finest carriages we have made, and I am greatly pleased. It is lighter than we expected, and this adds to her speed. While light, it is just as durable, and will be able to run on any kind of territory."

INN FOR TOURISTS—A WOMAN'S DREAM

"The automobile has opened a new field for women who have their own living to earn," observed a woman the other day who proposes to become the proprietor and manager of a new old-fashioned country inn. "People are just beginning to appreciate the many advantages of this novel means of travel," she observed, "and by next season I believe it will not only have taken the place of horses, but for short pleasure trips must rival the palace and observation cars.

"Don't imagine I refer to our becoming motormen as a profession. I mean that automobiles will so increase the travel over country roads that there is bound to be a demand for well kept public houses. Inns after the manner of those famous in the days of the stage coach and which are occasionally run across in England to-day. It is as keepers of these inns that women will find a new means of earning their living, and it is just a position as will appeal to the old-fashioned, womanly woman. The one who looks well after her house, keeps a good table, attends to her chickens and her cows and maybe fattens her own roasting pigs. The place I have taken is on a mountain road, a good day's run from L——, and has quite a nice little farm attached. I am having the entire place put in order, and the house, which, though comparatively new, is old-fashioned looking, remodeled after the type of the Blue Dragon, the Peacock and other famous hostelries where I have stopped in Great Britain. It is a large house, and almost entirely overrun by Virginia creeper, and while the windows are both broad and tall, the sashes have those diamond leaded panes we all admire. Then, too, there are several tall chimneys and a number of peaks and gables to the roof, so you see I really had a good foundation to begin with as far as appearances were concerned.

"The interior I am having changed. The walls and ceilings are all modeled on old-time methods, and so is the furniture. The beds are high teastered affairs with deep valances of white dimity, and the presses and chests of drawers all have that cleanly, delightful odor which only a bunch of rosemary and other such sweet-smelling herbs can give.

"And, by the way, perhaps I had best tell you now before I forget it. In the kitchen garden I have planted a good supply of herbs for just such purposes, and I also secured several bushes of that old-fashioned sweet rose from which our grandmothers distilled their rose water and used the petals to scatter among their laces and fine linen. But my gardener tells me they will not grow in this climate. Do you know anything about them?" Here the future innkeeper looked

anxiously at the writer, and recognizing a reply in the negative, heaved a sigh of regret and continued:

"The public rooms will be even more like those of the English inns than my bed-chambers—for to tell the truth, while following foreign models in appearance I have made those chambers thoroughly modern as far as conveniences are concerned. The floors of the public rooms will be sanded and some of them at least strewn with fresh rushes every week.

"There will not be a yard of carpet in the house, and the guests may have feather beds whenever they prefer them —the thick downy kind that our grandparents considered so comfortable. The water works will only be in evidence in the bath rooms, and these, though numerous, are not so conspicuous as to give their surroundings an incongruous appearance.

"Of course, I am to have open fireplaces, big old-fashioned ones, in every room in the house, and in each of the wide halls. They will constitute one of the chief charms of the place, and as wood is both plentiful and cheap you may be sure there will always be roaring fires of big logs when the weather demands it.

"My glass and china is plain, and where I could not secure pewter I took heavy old-time plate engraved with the arms of my inn; an inn always has arms, you know. The kitchen is both old and new. It has all modern conveniences as well as a huge fireplace, a roasting spit and a Dutch oven.

"On the farm and in the gardens I shall raise all the vegetables, melons and fruits used at the inn. I take great pride in my poultry and cows, and assure you I have spared neither trouble nor expense fitting up my fowl houses and dairy. The latter I am sure will interest you. It is built of rough stone, and has a stream of water running through it. Not well water pumped up and sent through pipes, but a clear mountain brook, over a pebbly bed that babbles as it flows, and I trust will always keep my dairy maid in an amiable mood, as well as preserve the butter and milk at a low temperature.

"You ask why such inns have not been thought of before. The people who travel in horseless carriages will belong to a well-to-do class, both willing and able to pay for such comforts when making trips through the country in their own machine, for business or pleasure. They will be about the same class as those who, in days gone by, journeyed by stage coach; while not the very wealthiest, perhaps, they will be able to appreciate and pay for the hospitalities of such country hostelries. It is a new field for women workers, and I believe one they will gladly welcome."

JAPAN'S HORSELESS CARRIAGE

The rage for the automobile has somewhat lessened the fever for the jinriksha, muses Rose M. Field in the Chicago Post, but we have no doubt that the older method of transportation will sooner or later come into its own. For while we may be tempted to reserve the automobile for our own uses, there is no reason why we should not provide jinrikshas for our hired girls, who are rapidly p.
up to our social level. It would be very gratifying to Hulda and Bridget to speed through the park Thursday afternoons, drawn by honest hearts and willing hands, and it would reassure them as to the true meaning of our boasted democracy which, in the words of our friend from Texas, "recognizes that a woman is a lady no matter where she may be." For the present, then, we must prescribe the automobile for the rich and arrogant and the jinriksha for the poor and comparatively lowly. The automobile will make better time, but the occupant of the jinriksha will boss and drive a man, and that is a tremendous consideration among the ladies in the land of true democracy.

A MATTER OF VANITY

"I do not think the automobile is going to be popular for any length of time with our fashionable people," said Adjutant General Corbin today. "During my recent stay in Newport I met a number of wealthy people who had purchased automobiles early in the season, and I asked them how they liked these novel vehi-

cles. Almost without exception they told me that they did not think the fad for them would last long. They said the automobile would never take the place of the horse with the fashionable set. The fact of the matter is, the swell woman does not appear to as great advantage in an automobile as she does behind a pair of fine horses."—Brooklyn Eagle.

BANGS' UNINSPIRED POEM

Smooth, sleek and oiliest of wheeling things,
I cannot find in my imaginings,
In natural or in supernatural ways,
The slightest reason to prolong thy days.

Of all the vain conceptions of the mind
Thou art the vainest that the ages find.
Except for those whose blood doth chance to flow
In dull and melancholy-wise, and slow.

What is the joy of driving? Is it mere
Transportment of the flesh from there to here?
A method whereby sluggish man may be
Removed from A to Izzard speedily?

Or is it pleasant for the eye to view
And hand to master steeds, or one or two,
When prancing o'er the hard and well-paved street,
With champing bits, and lithe limbs running fleet?

Avaunt! thou horridest of modern things!
Vamoose! Unto thy ugly self take wings!
Think not with all thy gaud and glitter coarse
Thou'lt e'er supplant that best of friends, the horse.

—John Kendrick Bangs in Woman's Home Companion.

BUILT BY REEVES PULLEY COMPANY

One of the Gasolene Motor Vehicles Built by Reeves Pulley Company of Columbus, Ind., to Test the Reeves Variable Speed Gear. (See page 98.)

WHERE THEORY OR PROMISE PREVAILS

BEARINGS FOR MOTOR VEHICLES

BY MYRON FRANCIS HILL

DISCUSSION OF THE REQUIREMENTS FOR BEARINGS THAT ARE UNDER HEAVY LOAD.—THE WRITER'S OWN CONSTRUCTION.

Some of the bearings proposed for motor vehicles form an interesting study. There are three general categories, the parallel bearing, the ball bearing, and the roller bearing.

The parallel or ordinary axle bearing is the most ancient, of course, and its use on carriages, wagons and trucks, has given us a good idea of its capabilities and its faults. Aside from the hot boxes which sometimes develop, all parallel bearings have been found to wear, to need cleaning and oiling, and to lose power through friction.

Plain Axle Bearings.

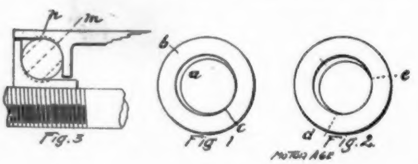
In figure 1 is a section of a parallel bearing in which a is the axle, b the hub, and c the part where they touch. As the hole in the hub b cannot be the same size as the axle a and contain any oil, it has to be larger. And if it is larger the axle rests at c only, which represents the line along which the axle and the hub are in contact.

It requires only a slight amount of wear on the axle to increase the surface of contact to something like that shown in figure 2, from d to e. To keep the wear to the minimum amount, the hubs are often lined with a soft metal, but the wear on the axle still takes place even in a soft hub; and as the wear on the revolving hub is distributed over its whole surface and that on the axle is on its under side only, the axle soon has a considerable area worn to the curve of the hub.

The great objections to this wearing of the axle are the poorer distribution of the lubricant, causing increased friction and wear, the deterioration of the lubricant which becomes gritty owing to the worn metal it contains, and the wabbling of the wheel which injures the gearing. Frequent renewal of the lubricant is required. The expense of new lubricant, of the time and labor required to apply it, and of the loss of power through worn bearings (often amounting up from .10 to .25, or even .30), and the loss of income, or of time while the vehicle is withdrawn from use, are so great that considerable initial expense is warranted if a bearing can be found in which these features are practically eliminated.

Highest Type Required.

There is another factor which has much weight. Automobiles are necessarily so complicated that there will be a strenuous demand for a rig which requires no atten-



tion. This argument would remove parallel bearings from any possible association with automobiles.

A third factor will doubtless have more influence than all the foregoing. The purchasers of motor carriages demand the best, and nothing less will satisfy them. It was this demand that had a tremendous influence in introducing ball bearings for bicycles. In competition such a "card" has great weight, and no builder can afford to pass it by.

Weakness of Ball Bearings.

Ball bearings, so satisfactory for bicycles, are, to some extent, used for motor carriages. They certainly possess many advantages over the parallel bearing for lighter vehicles. The great weakness of ball bearings is lack of rolling surface. In bicycles the weight which they sus-

tain is slight. But in motor carriages, which weigh several hundred, and even several thousand pounds, the wear becomes a serious quantity. In bicycles a season, possibly two, are all that are counted on by many dealers.

The bearings have then lost many of their virtues. Under heavier weights and the sharper thrusts and strains of a motor carriage, ball bearings prove less efficient than in bicycles.

The slight rolling surfaces of balls and cones and the wear between balls which rub against each other or against a cage, cause them to deteriorate. The surfaces under compression crystallize and flake off; the oil becomes gritty; and before long the bearing cone becomes so worn on one side that even the adjustment fails to work, and the balls have lost their roundness. In these defects are found the causes of many broken balls and broken cones.

Several attempts have been made to increase the rolling surface of ball bearings. In one attempt, balls have been mounted in a cage and "staggered" so that no two balls roll on the same line around the cone. This idea increases the rolling surface on the cone, but not on the balls. This causes the cone to wear away more slowly and the balls to wear away somewhat more rapidly, but the "net" result is undoubtedly better. In another attempt the cones are concaved with a curve a little larger than the curve of the balls, as shown in figure 3.

A little wear brings a large surface of the ball into contact with the cone, and the zones of the ball on either side of the equatorial circle drag on the cone, introducing a wear and friction and a necessity of frequent lubrication heretofore absent in a good ball bearing. Both of these attempts are perhaps improvements over the older ball bearings and are aimed at their radical defect, a slight rolling surface. It would seem then, that if a roller bearing could be devised which in other respects was equal to ball bearings, such a roller bearing, with its ample rolling surface, would displace them.

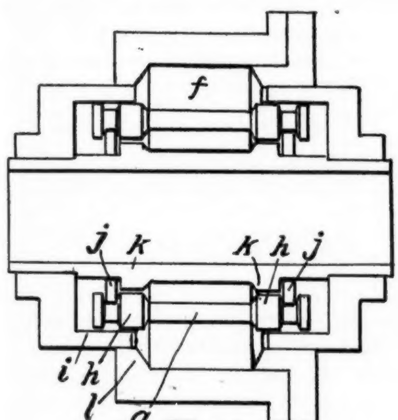


Fig. 4.

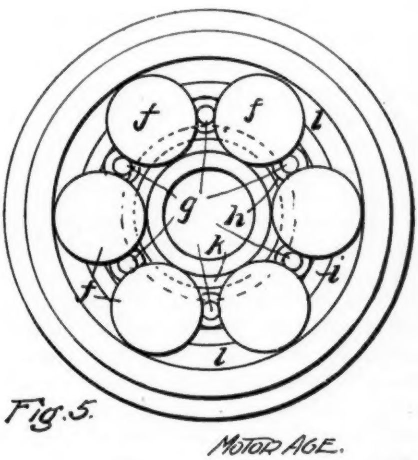


Fig. 5.

Troubles With Caged Roller Bearings.

In roller bearings, however, two new difficulties are introduced. First, rollers are bound to twist unless guided in some manner. If they twist they are apt to bind and break. And second, some end thrust bearing is essential.

To prevent rollers from twisting some kind of a controlling or guiding device is a necessity for vehicle use. When a roller twists it rests on its middle diagonally across the axle, and the hub rests on its ends, and if the roller twists far enough to bind, it will break.

Rollers have been mounted in cages, in slots or on pivots to keep them from twisting. Such ideas have been numerous, but, in trial, rollers rub upon their cages, and wear is a natural result. Moreover the rollers have to be somewhat loosely mounted and free to twist to some

extent, which strains the roller, and wears on the cage. Before long caged bearings wear loose and let the rollers out of position far enough to break. If the rollers have different speeds due to uneven wear or other causes, they grind heavily against the cage and wear through quickly. This wrecks the bearing.

Some caged roller bearings have been associated with ball bearings adapted to take the end thrust, though the logic of using rollers under the weight and then exposing balls to the sharpest and severest thrusts in a vehicle, such as striking curbs, rails, stones, and the like, where sometimes the tire cannot act as a cushion, is not apparent. Broken balls were frequently the result.

The roller bearing put on the market by the writer is, of course, designed to overcome the evil features of bearings here pictured. It is called the "A. R. B.," and is shown in figures 4 and 5.

Between the large rollers f are separating rollers i with enlarged ends h overlapping the ends of the main rollers. The central portions of the separators prevent the main rollers from rubbing against each other, and the overlapping ends keep them from twisting. The ends are so mounted on supports i, j, as not to slip or drag, but to roll harmoniously about the axle at the same speed with large rollers. The rollers run against a bevel, k, l, as used on the flange of a car wheel against a rail. The bevels prevent endwise displacement of all parts of the bearing. The bearing runs dry even better than when oiled, but oil is preferred to prevent rust.

All parts in this bearing are hardened steel and the tests that have been made with it show that it certainly has the longest life, the least wear, the least friction, and requires the least lubrication and attention of any bearing known to the writer.

THE REEVES VARIABLE SPEED GEAR

From the Reeves Pulley Company, of Columbus, Ind., The Motor Age is in receipt of a new special catalogue, describing and illustrating the Reeves variable speed countershaft for machinery and motor vehicles. The company is best known for its wood split pulley which is known the world over and has received the sincere indorsement implied by extensive imitation in Germany. The speed variator when made for motor vehicles takes the form shown in the accompanying diagram.

Two cones are mounted on the motor shaft and two similar cones on the countershaft, both pairs being adjustable laterally on their respective shafts by the bar arrangement shown in the diagram, so that when the cones on the motor shaft are close together those on the countershaft are far apart and vice versa, allowing locked adjustment at all intermediate stages, of course. The specially constructed belt runs between these cones bearing upon the conical surfaces with the beveled edges of the belt only. When the cones on the motor shaft are forced together the belt is therefore expanded and forced to run on a large circle around the shaft, while simultaneously the cones on the countershaft are separated, allowing the belt to contract so as to run on a small circle around the countershaft. Evidently all relative speeds of motor shaft and countershaft which come within the design of the device, may be effected by manipulating the adjusting-bars, if the belt and pulley cones are so accurately made that the belt will maintain its proper relations to the conical surfaces and will expand evenly and smoothly when required to do so.

From a purely theoretical consideration of the construction we should imagine that speed changes by this system were most easily effected at high speeds and that under all circumstances a change must be effected slowly and gradually.

In regard to its own experience with

the device the company says in the catalogue:

We know from practical experience that there are several things easier to build than a motocycle that will run.

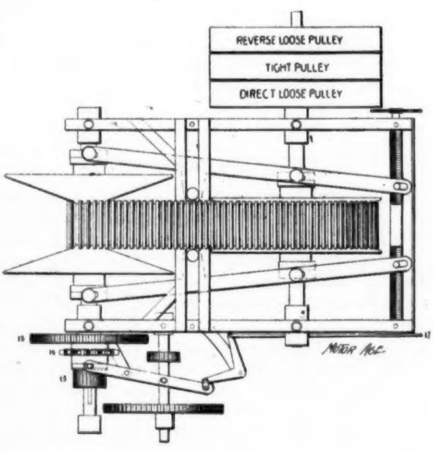
We believe all the head-splitting problems connected with their construction will eventually be solved. From actual experience we know that the Reeves Speed Variator with back-gear attachment solves one of the most troublesome problems, viz., the transmission of the power from the source of supply to the wheels of the vehicle.

Every motocycle experimentalist knows that the road conditions are constantly varying, and that to meet these ever-changing conditions the machine must be as variable and pliant as a well broken span of coachers. Anything short of this, any kind of step cones or fixed speeds, are merely "makeshifts" and are not and cannot be satisfactory.

To fully satisfy ourselves as to the value of this device for this service, we have built three motocycles.

Two of these machines have been subjected to the most severe tests and have covered, together, at least 10,000 miles of every conceivable kind of road, from the macadamized boulevard of the city to the sand hills of northern Michigan.

The power used is an ordinary gasolene engine; even the larger vehicle only carrying a six horse-power, all other parts of the machine are of the ordinary construction.

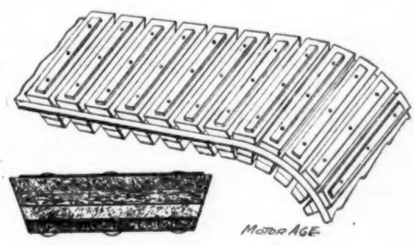


The distinctive feature is the Reeves speed varying device.

Illustrations of the carriages referred to are presented, one on page 95 and the other on the front cover.

The belt is shown in Fig. 2. It is composed of a series of leather and iron strips, riveted on to a rawhide base.

"This enables us," says the catalogue, "to get a powerful bearing on the edges without in the least kinking the belt or in any way getting it out of shape. There is provided a screw take-up should this



belt at any time need tightening. It is made practically continuous or endless, and therefore needs no attention whatever, and will run for years."

ELECTRIC CABS FOR MINNEAPOLIS

A company is in process of formation in Minneapolis for the purpose of operating a line of electric cabs next year. S. N. Smith, local representative of the Woods Motor Vehicle Company of Chicago, is at the head of the new enterprise, and he states that the company will be incorporated with a capital stock of $250,000.

MANY PICTURES—FEW SUCCESSES

If illustrations of motor vehicles illustrated the troubles that under certain conditions may be encountered in operating them, fewer of them would be published. The engraver is the spellbinder of every thoughtless boom. He weaves the enchanted veil through which the wise see activity, but the foolish perfection.

MINOR MENTION

The projected motor vehicle exhibition in Charleston, S. C., has come to naught.

Charles E. Duryea, of Peoria, Ill., is at work on a motor tandem to be used as a pacing machine. There will be no pedals but a six H. P. 3-cylinder Duryea gas motor.

THE MOTOR AND PARTS TRADE

ABOUT MOTORS AND TIRES

GASOLENE MOTORS EASILY REPAIRED.—SECOR'S INTERESTING KEROSENE MOTOR.—HENDERSON'S PROPOSITION IN REGARD TO TIRES.

MOTORS MADE IN CALIFORNIA

A. D. Stealey furnishes the following brief description of his new style of 2 B. H. P. horizontal gasolene carriage motor which is manufactured at 117 First street, San Francisco: It measures 26½ inches long, 12 inches high, 11 inches wide, weight 120 lbs. including fly-wheel. Cylinder, head and valves water jacketed to prevent overheating. Normal speed 500 revolutions per minute, variable from 200 to 1,000 revolutions per minute. Ordinary stove gasolene is used, the consumption being 1½ pints per hour. Motor is noiseless even at highest speed. It is self-lubricating. Every bearing is adjustable for wear. The motor can be entirely dismantled, and the head, exhaust, inlet valves, electrode and ignitor removed for cleaning, inspection and repair without disturbing the setting of any cams or levers, or requiring the services of an expert to put it together again, thus enabling a person unaccustomed to machinery to repair it in case of damage or accident. This Mr. Stealey considers one of the most valuable features of the motor. There are no gaskets or packing of any sort, but the joints are ground and scraped to a perfect fit, and are oil, water and air tight. With every motor are sent duplicate small parts, so that in case of an accident the motor can be repaired almost instantly.

Mr. Stealey builds these motors in various sizes from 1 to 10 H. P., single and double cylinder, horizontal and vertical, for all sorts of stationary, marine or vehicle use.

BELIEVES IN THE SPRING TIRE

Editor Motor Age.—In my estimation what is wanted and what I claim will be ushered into the automobile industry by the beginning of the twentieth century is a mechanically constructed tire having all the life to be found in the best pneumatic tires at the present time, or that can be produced equally as durable, one that would be less liable to get out of order and easier to repair. A tire that could be manufactured equally as cheap, if not cheaper, than the best pneumatic tire; a tire that is absolutely punctureless, having no air tube, no valve, no pump; a tire with less friction than the pneumatic, hence beyond any doubt a faster tire. I claim that for use on country roads the mechanically constructed tire can be made with a flat suface broad enough to pass over the widest ruts found in badly kept country roads, and at the same time not run any harder than the pneumatic tires on ordinary roads, and a tire that will last longer than any pneumatic tire and will not require one-half the repairs.

I ask, is there a market for a tire as described above? I solicit correspondence and personal interviews from enterprising manufacturers of bicycles and automobiles. Having constructed and tested a mechanical tire embodying many points of advantage over the pneumatic I am prepared to demonstrate its practicability, and having given the bicycle industry my whole time and attention for the last fifteen years, I claim, without any boasting, to be in a position to know the requirements of the trade to which I refer. C. L. HENDERSON, Machinist.

Berlin, Ontario, Sept. 21.

SECOR'S KEROSENE MOTOR

Mr. Secor of Jersey City makes a kerosene oil motor which is illustrated and described by Hugh Dolnar in American Machinist, October 5. It is one of those interesting motors in which the oil is fed in liquid form to the motor in exact micrometer-adjusted quantities and is evaporated by the action of an exactly proportionate volume of air, so that the quality of the mixture remains the same whether the charge is great or small. Mr. Secor has found that the degree of compression, which with this system is subject to variation, has no effect on the force of the explosion, but that the same depends solely on the quantity of the charge.